

1. Express  $\frac{-3}{10}$  as a rational number with denominator 20.

**Ans.** In order to express  $-310$  as a rational number with denominator 20, we first find the number which when multiplied by 10 gives 20.

$$\text{Clearly, such a number} = 20 \div 10 = 2$$

Multiplying the numerator and denominator of  $-310$  by 2, we have

$$-310 = (-3) \times 210 \times 2 = -620$$

Therefore, expressing  $-310$  as a rational number with denominator 20 is  $\frac{-6}{20}$ .

2. Express  $\frac{-3}{10}$  as a rational number with denominator -30.

**Ans.** In order to express  $-310$  as a rational number with denominator -30, we first find a number which when multiplied by 10 gives -30.

$$\text{Clearly, such a number is} = (-30) \div 10 = -3.$$

Multiplying the numerator and denominator of  $\frac{-3}{10}$  by -3, we have

$$\frac{-3}{10} = \frac{(-3) \times (-3)}{10 \times (-3)} = \frac{9}{-30}$$

Therefore, expressing  $-310$  as a rational number with denominator -30 is  $\frac{9}{-30}$ .

3. Which of the two rational numbers  $\frac{3}{5}$  and  $\frac{-2}{3}$  is greater?

**Ans.** Clearly  $\frac{3}{5}$  is a positive rational number and  $\frac{-2}{3}$  is a negative rational number. We know that every positive rational number is greater than every negative rational number.

$$\text{Therefore, } \frac{3}{5} > \frac{-2}{3}.$$

4. Which of the numbers  $\frac{3}{-4}$  and  $\frac{-5}{6}$  is greater?

**Ans.** First we write each of the given numbers with positive denominator.

$$\text{One number} = \frac{3}{-4} = \frac{3 \times (-1)}{(-4) \times (-1)} = \frac{-3}{4}.$$

$$\text{The other number} = \frac{-5}{6}.$$

L.C.M. of 4 and 6 = 12

$$\text{Therefore, } \frac{3}{-4} = \frac{(-3) \times 3}{4 \times 3} = \frac{-9}{12} \text{ and } \frac{-5}{6} = (-5) \times 2 \times 2 = \frac{-10}{12}$$

Clearly,  $\frac{-9}{12} > \frac{-10}{12}$

Hence,  $\frac{3}{-4} > \frac{-5}{6}$ .

5. Represent  $\frac{1}{2}$  and  $-12$  on the number line.

**Ans.** Draw a line. Take a point O on it. Let the point O represent 0. Set off unit lengths OA to the right side of O and OA' to the left side of O.

Then, A represents the integer 1 and A' represents the integer -1.



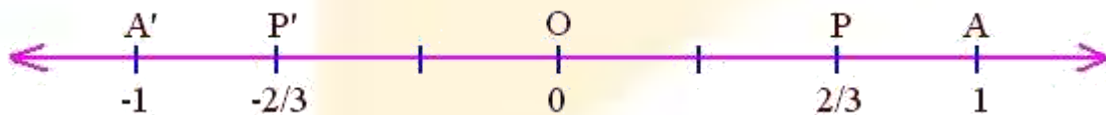
Now, divide the segment OA into two equal parts. Let P be the mid-point of segment OA and OP be the first part out of these two parts. Thus,  $OP = PA = \frac{1}{2}$ . Since, O represents 0 and A represents 1, therefore P represents the rational number  $\frac{1}{2}$ .

Again, divide OA' into two equal parts. Let OP' be the first part out of these two parts. Thus,  $OP' = PA' = \frac{-1}{2}$ . Since, O represents 0 and A' represents -1, therefore P' represents the rational number  $\frac{-1}{2}$ .

6. Represent  $\frac{2}{3}$  and  $\frac{-2}{3}$  on the number line.

**Ans.** Draw a line. Take a point O on it. Let it represent 0. From the point O set off unit distances OA to the right side of O and OA' to the left side of O respectively.

Divide OA into three equal parts. Let OP be the segment showing 2 parts out of 3. Then the point P represents the rational number  $\frac{2}{3}$ .



Again, divide OA' into three equal parts. Let OP' be the segment consisting of 2 parts out of these 3 parts. Then, the point P' represents the rational number  $\frac{-2}{3}$ .

7. Add  $\frac{4}{7}$  and 5.

**Ans.** We have,  $4 = \frac{4}{1}$

Clearly, denominators of the two rational numbers are positive. We now re-write them so that they have a common denominator equal to the LCM of the denominators.

In this case the denominators are 7 and 1.

The LCM of 7 and 1 is 7.

We have,  $5 = \frac{5}{1} = \frac{5 \times 7}{1 \times 7} = \frac{35}{7}$

Therefore,  $\frac{4}{7} + 5$

$$= \frac{4}{7} + \frac{5}{1}$$

$$= \frac{4}{7} + \frac{35}{7}$$

$$= \frac{4+35}{7}$$

$$= \frac{39}{7}$$

8. Find the sum:  $\frac{-5}{6} + \frac{4}{9}$

**Ans.** The denominators of the given rational numbers are 6 and 9 respectively.

LCM of 6 and 9 =  $(3 \times 2 \times 3) = 18$ .

Now,  $\frac{-5}{6} = \frac{(-5) \times 3}{6 \times 3} = \frac{-15}{18}$

and  $\frac{4}{9} = \frac{4 \times 2}{9 \times 2} = \frac{8}{18}$

Therefore,  $\frac{-5}{6} + \frac{4}{9}$

$$= \frac{-15}{18} + \frac{8}{18}$$

$$= \frac{-15+8}{18}$$

$$= -\frac{7}{18}$$

9. Subtract  $\frac{2}{5}$  from  $\frac{4}{7}$

**Ans.** The additive inverse of  $\frac{2}{5}$  is  $\frac{-2}{5}$

Therefore,  $\frac{4}{7} - \frac{2}{5} = \frac{4}{7} + \left(\frac{-2}{5}\right)$

$$\Rightarrow \frac{4}{7} - \frac{2}{5} = \frac{4 \times 5}{7 \times 5} + (-2) \times \frac{7}{5} \times 7$$

$$= \frac{20}{35} + \frac{-14}{35}$$

$$= 20 + \frac{-14}{35}$$

$$= \frac{6}{35}$$

Therefore,  $\frac{4}{7} - \frac{2}{5} = \frac{6}{35}$ .

10. Subtract  $-\frac{6}{7}$  from  $-\frac{5}{8}$ .

**Ans.** The additive inverse of  $\frac{-6}{7}$  is  $\frac{6}{7}$

Therefore,  $\frac{-5}{8} - \frac{-6}{7} = \frac{-5}{8} + \frac{6}{7}$ , [Since,  $-\left(\frac{-6}{7}\right) = \frac{6}{7}$ ]

$$\Rightarrow \frac{-5}{8} - \frac{-6}{7} = -5 \times \frac{7}{8} \times 7 + 6 \times \frac{8}{7} \times 8$$

$$\Rightarrow \frac{-5}{8} - \frac{-6}{7} = \frac{-35}{56} + \frac{48}{56}$$

$$\Rightarrow \frac{-5}{8} - \frac{-6}{7} = -35 + \frac{48}{56}$$

$$\Rightarrow \frac{-5}{8} - \frac{-6}{7} = \frac{13}{56}$$

Therefore,  $\frac{-5}{8} - \frac{-6}{7} = \frac{13}{56}$ .

11. Evaluate  $\frac{3}{5} + \frac{7}{3} + \frac{-11}{5} + \frac{-2}{3}$

**Ans.** Using the commutative and associative law, it follows that we may arrange the terms in any manner suitably. Using this rearrangement property, we have:

$$\frac{3}{5} + \frac{7}{3} + \frac{-11}{5} + \frac{-2}{3}$$

$$= \left(\frac{3}{5} + \frac{-11}{5}\right) + \left(\frac{7}{3} + \frac{-2}{3}\right)$$

$$= \frac{\{3 + (-11)\}}{5} + \frac{\{7 + (-2)\}}{3}$$

$$= \frac{-8}{5} + \frac{5}{3}$$

$$= \frac{(-24) + 25}{15} = \frac{1}{15}$$

12. Simplify:  $\left(\frac{4}{7} + \frac{-8}{9} + \frac{-5}{21} + \frac{1}{3}\right)$

Ans. Using the rearrangement property, we have:

$$\frac{4}{7} + \frac{-8}{9} + \frac{-5}{21} + \frac{1}{3} = \left(\frac{4}{7} + \frac{-5}{21}\right) + \left(\frac{-8}{9} + \frac{1}{3}\right)$$

$$= \frac{\{12 + (-5)\}}{21} + \frac{\{(-8) + 3\}}{9}$$

$$= \left(\frac{7}{21} + \frac{-5}{9}\right)$$

$$= \frac{\{21 + (-35)\}}{63}$$

$$= \frac{-14}{63}$$

$$= \frac{-2}{9}$$

13. Multiply  $\left(-\frac{25}{9}\right)$  by  $\left(-\frac{18}{15}\right)$

Ans.  $\left(-\frac{25}{9}\right) \times \left(-\frac{18}{15}\right)$

$$= \frac{(-25) \times (-18)}{9} \times 15$$

$$= \frac{450}{135}$$

$$= \frac{10}{3}$$

14. Simplify:  $\frac{-9}{7} \times \frac{5}{3}$

Ans.  $\frac{(-9)}{7} \times \frac{5}{3}$

$$= \frac{(-9) \times 5}{7 \times 3}$$

$$= -\frac{45}{21} = \frac{-15}{7}$$

15. **Simplify:**  $\left(\frac{-12}{7} \times \frac{35}{16}\right) - \left(\frac{9}{5} \times \frac{4}{3}\right)$

**Ans.**  $\left(\frac{-12}{7} \times \frac{35}{16}\right) - \left(\frac{9}{5} \times \frac{4}{3}\right)$   
 $= \left[\frac{(-12) \times 35}{7 \times 16}\right] - \left[\frac{9 \times 4}{5 \times 3}\right]$   
 $= \frac{-420}{112} - \frac{36}{15}$   
 $= \frac{-15}{4} - \frac{12}{5}$   
 $= \frac{(-15) \times 5}{4 \times 5} - \frac{12 \times 4}{5 \times 4}$   
 $= \frac{-75}{20} - \frac{48}{20}$   
 $= \frac{-75 - 48}{20}$   
 $= \frac{-123}{20}$ .

16. **Simplify:**  $\left(\frac{-3}{2} \times \frac{4}{5}\right) + \left(\frac{9}{5} \times \frac{-10}{3}\right) - \frac{1 \times 3}{2 \times 4}$

**Ans.**  $\left(\frac{-3}{2} \times \frac{4}{5}\right) + \left(\frac{9}{5} \times \frac{-10}{3}\right) - \frac{1 \times 3}{2 \times 4}$   
 $= \frac{(-3) \times 4}{2 \times 5} + \frac{9 \times (-10)}{5 \times 3} - \frac{3}{8}$   
 $= \frac{-12}{10} + \frac{-90}{15} - \frac{3}{8}$   
 $= \frac{-6}{5} + \frac{-6}{1} - \frac{3}{8}$   
 $= \frac{(-6) \times 8}{5 \times 8} + \frac{(-6) \times 40}{1 \times 40} - \frac{3 \times 5}{8 \times 5}$   
 $= \frac{-48}{40} + \frac{-240}{40} - \frac{15}{40}$   
 $= -48 + (-240) - \frac{15}{40}$   
 $= \frac{-303}{40}$

17. Divide:

(i)  $\frac{9}{16}$  by  $\frac{5}{8}$       (ii)  $\frac{-6}{25}$  by  $\frac{3}{5}$       (iii)  $\frac{11}{24}$  by  $\frac{-5}{8}$       (iv)  $\frac{-9}{40}$  by  $\frac{-3}{8}$

Ans. (i)  $\frac{9}{16} \div \frac{5}{8}$

$$= \frac{9}{16} \times \frac{8}{5}$$

$$= \frac{9 \times 8}{16 \times 5}$$

$$= \frac{72}{80}$$

$$= \frac{9}{10}$$

(ii)  $\frac{-6}{25} \div \frac{3}{5}$

$$= \frac{-6}{25} \times \frac{5}{3}$$

$$= \frac{\{(-6) \times 5\}}{25 \times 3}$$

$$= \frac{-30}{75}$$

$$= \frac{-2}{5}$$

(iii)  $\frac{11}{24} \div \frac{-5}{8}$

$$= \frac{11}{24} \times \frac{8}{-5}$$

$$= \frac{11 \times 8}{\{24 \times (-5)\}}$$

$$= \frac{88}{-120}$$

$$= \frac{-11}{15}$$

(iv)  $\frac{(-9)}{40} \div \frac{-3}{8}$

$$= \frac{-9}{40} \times \frac{8}{-3}$$

$$= \frac{\{(-9) \times 8\}}{40 \times (-3)}$$

$$= \frac{-72}{-120}$$

$$= \frac{3}{5}$$

18. The product of two numbers is  $-\frac{28}{27}$ . If one of the numbers is  $-\frac{4}{9}$ , find the other.

Ans. Let the other number be  $x$ .

$$x \times \frac{-4}{9} = -\frac{28}{27}$$

$$\Rightarrow x = \frac{-28}{27} \div \frac{-4}{9}$$

$$\Rightarrow x = \frac{-28}{27} \times \frac{9}{-4}$$

$$\Rightarrow x = \frac{\{(-28) \times 9\}}{\{27 \times (-4)\}}$$

$$\Rightarrow x = \frac{-(28 \times 9)}{-(27 \times 4)}$$

$$\Rightarrow x = \frac{287 \times 91}{273 \times 41}$$

$$\Rightarrow x = \frac{7}{3}$$

Hence, the other number is  $\frac{7}{3}$ .

19. Find out a rational number lying halfway between  $\frac{2}{7}$  and  $\frac{3}{4}$ .

Ans. Required number  $= \frac{1}{2} \left( \frac{2}{7} + \frac{3}{4} \right)$

$$= \frac{1}{2} \left( \frac{8 + 21}{28} \right)$$

$$= \left( \frac{1}{2} \times \frac{29}{28} \right)$$

$$= \frac{29}{56}$$

Hence,  $\frac{29}{56}$  is a rational number lying halfway between  $\frac{2}{7}$  and  $\frac{3}{4}$ .

20. Find out a rational number lying between  $-\frac{1}{3}$  and  $\frac{1}{2}$ .

Ans. Required number  $= \frac{1}{2} \left( \frac{2}{7} + \frac{3}{4} \right)$

$$\text{Required number} = \frac{1}{2} \left( \frac{-1}{3} + \frac{1}{2} \right)$$



$$= \frac{1}{2} \left( \frac{(-2) + 3}{6} \right)$$

$$= \left( \frac{1}{2} \times \frac{1}{6} \right)$$

$$= \frac{1}{12}$$

Hence,  $\frac{1}{12}$  is a rational number lying between  $\frac{1}{3}$  and  $\frac{1}{2}$ .